

What is claimed is :

- 1.A photo sensing integrated circuit device comprising:
a light-receiving element having a light-receiving portion formed on
5 a chip surface thereof;
a digital circuit element, an analog circuit element and a circuit
adjusting element cooperatively processing a detection signal produced from
said light-receiving element; and
a light-shielding film provided for selectively setting a light-receiving
10 region on said chip surface.
2. The photo sensing integrated circuit device in accordance with claim
1, wherein said digital circuit element is an integrated injection logic element.
- 15 3. The photo sensing integrated circuit device in accordance with claim
1, wherein said analog circuit element is a bipolar transistor.
4. The photo sensing integrated circuit device in accordance with claim
1, wherein said circuit adjusting element is a thin-film resistor formed on said
20 chip surface.
5. The photo sensing integrated circuit device in accordance with claim
1, wherein said light-shielding film is an aluminum-group metallic film
disposed on said chip surface.
- 25 6. The photo sensing integrated circuit device in accordance with claim
5, wherein said light-receiving film is provided on an insulating film formed

on said chip surface for flattening processing.

7. The photo sensing integrated circuit device in accordance with claim 6, wherein said insulating film is formed by laminating a first tetra-ethyl-
5 ortho-silicate film, a spin-on-glass layer, and a second tetra-ethyl-ortho-silicate film successively.

8. The photo sensing integrated circuit device in accordance with claim 5, wherein said light-shielding film is electrically connected to a terminal
10 having a predetermined electric potential.

9. The photo sensing integrated circuit device in accordance with claim 8, wherein said light-shielding film is connected to a terminal giving an electric potential of a chip substrate.

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10. The photo sensing integrated circuit device in accordance with claim 1, wherein a chip substrate is a silicon substrate having a surface azimuth defied by (100).

20 11. The photo sensing integrated circuit device in accordance with claim 1, wherein said light-shielding film covers a surface of an element having electric characteristics varying in response to light irradiation and uncovers said light-receiving element and said circuit adjusting element.

25 12. The photo sensing integrated circuit device in accordance with claim 11, wherein said element having electric characteristics varying in response to light irradiation is at least one selected from the group consisting

of an integrated injection logic circuit element, a bipolar transistor, a diffusion resistor, a diode, and a capacitor utilizing a depletion-layer capacitance in a p-n junction.

5 13. A photo sensing integrated circuit device comprising:

 a photoelectric transfer element formed at a predetermined portion of a semiconductor substrate for converting received light into an electric signal; and

 a signal processing circuit formed at a predetermined portion of said
10 semiconductor substrate for processing said electric signal of said photoelectric transfer element, wherein

 said photoelectric transfer element and said signal processing circuit are integrated as a single chip,

 at least one circuit element of said signal processing circuit is covered
15 by a light-shielding film,

 said semiconductor substrate has at least one element forming region for separately forming said circuit element in said element forming region, and

 said circuit element is maintained at a predetermined electrical
20 potential.

 14. A photo sensing integrated circuit device comprising:

 a photoelectric transfer element formed at a predetermined portion of a semiconductor substrate for converting received light into an electric signal;
25 and

 a signal processing circuit formed at a predetermined portion of said semiconductor substrate for processing said electric signal of said

photoelectric transfer element, wherein

said photoelectric transfer element and said signal processing circuit are integrated as a single chip,

at least one circuit element of said signal processing circuit is covered

5 by a light-shielding film,

said semiconductor substrate has at least one element forming region for separately forming said circuit element in said element forming region, and

said circuit element is electrically connected to a power source terminal

10 having an electrical potential capable of maintaining a parasitic transistor of said semiconductor substrate in a turned-off condition.

15. A photo sensing integrated circuit device comprising:

a photoelectric transfer element formed at a predetermined portion of

15 a semiconductor substrate for converting received light into an electric signal; and

a signal processing circuit formed at a predetermined portion of said semiconductor substrate for processing said electric signal of said photoelectric transfer element, wherein

20 said photoelectric transfer element and said signal processing circuit are integrated as a single chip,

at least one circuit element of said signal processing circuit is covered by a light-shielding film,

said semiconductor substrate has at least one element forming region

25 for separately forming said circuit element in said element forming region, and

said circuit element is electrically connected to a power source terminal

so that a base potential becomes equal to or larger than an emitter potential in a parasitic transistor of said semiconductor substrate.

16. An adjusting method for a single chip photo sensing device
5 comprising a photoelectric transfer element for converting received light into an electric signal, a signal processing circuit for processing said electric signal of said photoelectric transfer element, and a thin-film resistor used for a circuit adjustment, said adjusting method comprising the steps of:
- connecting an ammeter to an output terminal of said photoelectric
10 transfer element;
 - irradiating reference light having a predetermined intensity on said photoelectric transfer element;
 - storing a current value detected by said ammeter when said photoelectric transfer element is irradiated by said reference light;
 - 15 replacing said ammeter with a current generating source;
 - supplying current from said current generating source to said signal processing circuit by an amount identical with said stored current value under a condition no light is irradiated on said photoelectric transfer element; and
 - performing a laser trimming on said thin-film resistor to generate a
20 desired output from said signal processing circuit as a result of the circuit adjustment.

17. The adjusting method in accordance with claim 16, wherein said photoelectric transfer element is a photo diode and said output terminal is an
25 anode.

18. The adjusting method in accordance with claim 16, wherein said

circuit adjustment is performed on a wafer comprising a plurality of sensor forming segments.

19. An adjusting apparatus for a single chip photo sensing device
5 comprising a photoelectric transfer element for converting received light into an electric signal, a signal processing circuit for processing said electric signal of said photoelectric transfer element, and a thin-film resistor used for a circuit adjustment, said adjusting apparatus comprising:
- an ammeter connected to an output terminal of said photoelectric
10 transfer element;
 - a light source for irradiating reference light having a predetermined intensity on said photoelectric transfer element;
 - a memory means for storing a current value detected by said ammeter when said photoelectric transfer element is irradiated by said reference light
15 emitted from said light source;
 - a current generating source replaceable with said ammeter for supplying current to said signal processing circuit by an amount identical with said current value stored in said memory means; and
 - a laser oscillator for performing a laser trimming on said thin-film
20 resistor to generate a desired output from said signal processing circuit in response to said current entered from current generating source as a result of the circuit adjustment, said laser trimming being performed under a condition no light is irradiated on said photoelectric transfer element.

- 25 20. The adjusting apparatus in accordance with claim 19, wherein said photoelectric transfer element is a photo diode and said output terminal is an anode.

21. The adjusting apparatus in accordance with claim 19, wherein said circuit adjustment is performed on a wafer comprising a plurality of sensor forming segments.

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22. The photo sensing integrated circuit device in accordance with claim 1, wherein

at least one circuit element, selected from the group consisting of said digital circuit element, said analog circuit element and said circuit adjusting
10 element, is covered by said light-shielding film,

at least one element forming region is provided for separately forming said selected circuit element, and

said selected circuit element is maintained at a predetermined electrical potential.

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23. The photo sensing integrated circuit device in accordance with claim 22, wherein said selected circuit element is electrically connected to a power source terminal supplying a voltage for maintaining a parasitic transistor of said integrated circuit device in a turned-off condition.

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24. The photo sensing integrated circuit device in accordance with claim 22, wherein said selected circuit element is electrically connected to a power source terminal so that a base potential becomes equal to or larger than an emitter potential in a parasitic transistor of said integrated circuit device.

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25. The photo sensing integrated circuit device in accordance with claim 22, wherein said selected circuit element is said analog circuit element.

26. An adjusting method for a photo sensing integrated circuit device comprising a light-receiving element having a light-receiving portion formed on a chip surface thereof, a signal processing circuit comprising a digital circuit element, an analog circuit element and a circuit adjusting element
5 cooperatively processing a detection signal produced from said light-receiving element, and a light-shielding film provided for selectively setting a light-receiving region on said chip surface, said adjusting method comprising the steps of:

connecting an ammeter to an output terminal of said light-receiving
10 element;

irradiating reference light having a predetermined intensity on said light-receiving portion of said light-receiving element;

storing a current value detected by said ammeter when said light-receiving portion is irradiated by said reference light;

15 replacing said ammeter with a current generating source;

supplying current from said current generating source to said signal processing circuit by an amount identical with said stored current value under a condition no light is irradiated on said light-receiving portion of said light-receiving element; and

20 performing a laser trimming on said circuit adjusting element to generate a desired output from said signal processing circuit.

27. The adjusting method in accordance with claim 26, wherein said light-receiving element is a photo diode and said output terminal is an anode.
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28. The adjusting method in accordance with claim 26, wherein said adjustment is performed on a wafer comprising a plurality of sensor forming

segments.

29. An adjusting apparatus for a photo sensing integrated circuit device comprising a light-receiving element having a light-receiving portion formed
5 on a chip surface thereof, a signal processing circuit comprising a digital circuit element, an analog circuit element and a circuit adjusting element cooperatively processing a detection signal produced from said light-receiving element, and a light-shielding film provided for selectively setting a light-receiving region on said chip surface, said adjusting apparatus
10 comprising:

an ammeter connected to an output terminal of said light-receiving element;

a light source for irradiating reference light having a predetermined intensity on said light-receiving portion of said light-receiving element;

15 a memory means for storing a current value detected by said ammeter when said light-receiving portion is irradiated by said reference light emitted from said light source;

a current generating source replaceable with said ammeter for supplying current to said signal processing circuit by an amount identical
20 with said current value stored in said memory means; and

a laser oscillator for performing a laser trimming on said circuit adjusting element to generate a desired output from said signal processing circuit in response to said current entered from current generating source, said laser trimming being performed under a condition no light is irradiated on
25 said light-receiving portion of said light-receiving element.

30. The adjusting apparatus in accordance with claim 29, wherein said

light-receiving element is a photo diode and said output terminal is an anode.

31. The adjusting apparatus in accordance with claim 29, wherein said adjustment is performed on a wafer comprising a plurality of sensor forming
5 segments.